Original Article

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Dentistry Section

Evaluation of Relationship Between Demographics and Dental Status in a Defined Group of Iranian Paediatric Patients Undergoing Cancer Therapy

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ABSTRACT

Context: Cancer is a major cause of death in children under 15 years of age.

Aims: This study aimed to evaluate relationship between demographics and dental status in a defined group of Iranian paediatric patients undergoing cancer therapy.

Settings and Design: This cross-sectional study was accomplished on 161 subjects age ranging 8-12 years. There were 76 cancerous patients hospitalized at Mahak Hospital (one of the major children's cancer centers in Tehran) as the study group and 85 healthy children attending at Dental School, International Branch of Shahid Beheshti University of Medical Sciences, Tehran, Iran from 2012 to 2013.

Materials and Methods: Demographics were gathered by using data-form. Oral examination and DMFT Index were used to describe teeth status in all teeth and in the first permanent molars. According to Becker's definition, "D" stands for untreated decayed teeth, "M" indicates missing teeth, and "F" shows Filled teeth. It is noteworthy that full coverage crowns are considered as "F" in this Index.

Statistical Analysis: Chi-square, Mann-Whitney U, Student's t-tests and Logistic Regression were used for data analysis.

Results: The most frequent type of cancer was acute lymphoblastic/lymphocytic leukemia (33.3%). Patients were significantly shorter than controls (p=0.03), and their fathers and mothers were of lower educational achievement (p=0.01, p= 0.001). Although DMFT of all dentition showed significantly higher score in cancerous children (p=0.001), DMFT of four first permanent molars (left, right, upper, and lower) was borderline significantly higher in patients (p= 0.06). Moreover, frequency of cancer was borderline significantly higher in children with lower birth order (p= 0.05). According to Logistic Regression, in as much as patients grew elder 1 year, DMFT index increased 1.5 units.

Conclusion: Patients under cancer therapy were shorter than healthy ones, and their parents were of lower educational levels. In addition, their teeth status was poorer than controls.

Keywords: Children, Iran, Neoplasm, Tooth

INTRODUCTION

Cancer in all its forms accounts for about 12% of deaths throughout the world [1]. It is also considered as the leading cause of death in developed countries and the second mortality causality in developing ones [2,3]. Meanwhile, cancer is one of the most important contributors to death in children under 15, in a way that almost 50% of new cases occur in this group [4]. In the developed countries, it is the second cause of death in children over one-year-old as well [5]. The prevalence of cancer in children increased as 4.1% during 1973-1988, and thereafter as1% per year [6]. Reasons for raised incidence of cancer in children is not well understood, but genetics and environmental factors might be involved [7].

Oral manifestations and complications are mostly encountered in cancerous patients, especially in children [8]. Xavier demonstrated that more than 90% of leukemic children suffer from oral complications [9].

Few studies regarding demographics and oral changes of cancerous children are available in Iran as a developing country. Therefore, the aim of this study was to evaluate the relationship between demographics and dental status in a defined group of Iranian paediatric patients undergoing cancer therapy.

MATERIALS AND METHODS

This cross- sectional study was performed on 76 children aging 8-12 under cancer therapy hospitalized at Mahak Hospital (one of the major children's cancer centers in Tehran, Iran) and 85 healthy sex and age-matched children attending at Dental School, International Branch of Shahid Beheshti University of Medical Sciences, Tehran, Iran from October 2012 to June 2013. We studied 8-12-year-old children to ensure that all of deciduous teeth were replaced by permanent teeth and first permanent molars were erupted. Children under cancer therapy without any signs of fever, or neutropenia (neutrophil count below 2000/mm^3) on the day of examination were eligible to enter the study. Those who did not co-operate appropriately were excluded from the study. Out of total 80 patients under cancer therapy during the time of study, four patients were excluded due to fever and neutropenia. Demographic information of each participant was gathered by using data-form including age, gender, height, weight, birth order, parental education, parental occupation, duration of breastfeeding or formula feeding, consumption of nutritional supplements during pregnancy or under age of two, type of cancer, method and duration of cancer therapy, and dental status.

A senior dental student (last semester of general dentistry course) did oral examination by means of dental mirror and Shepherd's hook explorer#23 (Hu-Friedy, Chicago, USA) under the light of dental unit. We used DMFT Index (decayed, missing, filled Teeth) to describe dental status of subjects in all teeth generally and in four first permanent molars, especially because of its key role in dental occlusion. According to Becker's definition, "D" stands for untreated decayed teeth, "M" indicates missing teeth, and "F" shows Filled

teeth. It is noteworthy that full coverage crowns are considered as "F" in this Index [10].

Informed written consent form was signed by children's parents before beginning the study.

STATISTICAL ANALYSIS

Data analysis was performed by means of SPSS soft ware, version 18 (Chicago, IL, USA). Chi-square test, Mann-Whitney U test, Student's t-test, and Logistic Regression were used to analyze the qualitative, non- parametric quantitative data, and effect of all confounding variables on DMFT index, respectively. P-value less than 0.05 considered significant.

RESULTS

Out of 76 patients under cancer therapy, males constituted 40 cases (52%) and females 36 (48%). Eighty-five healthy controls comprised of 36 males (42%) and 49 females (58%). Both study

	Cancerous children	Healthy children	p-value
Age mean± SD	10.6±1.4	11.1±1.3	0.07*
Gender			
Boy	40 (52%)	36 (42%)	0.19†
Girl	36 (48%)	49 (58%)	
Height (centimeter) mean± SD	145.9±14.9	152.9±18.7	0.03*
Weight	40.1±16.7	44.2±13.5	0.09*
Birth order			
First	38 (23.6%)	38 (23.6%)	0.05†
Second	19 (11.8%)	19 (11.8%)	
Third	11 (6.8%)	11 (6.8%)	
Fourth	6 (3.7%)	6 (3.7%)	
Fifth	2 (1.2%)	2 (1.2%)	
Sixth	0 (0%)	0 (0%)	
Paternal education			
Illitrate	5 (3.1%)	1 (0.6%)	<0.01†
<High school	24 (15%)	12 (7.5%)	
High school	24 (15%)	44 (27.5%)	
Academic	23 (14.4%)	27 (16.9%)	
Maternal education			
Illiterate	6 (3.8%)	1 (0.06%)	<0.00†
<High school	24 (15%)	9 (5.6%)	
High school	29 (18.1%)	46 (28.8%)	
Academic	17 (10.6%)	28 (17.5%)	
Paternal occupation			
Unemployed	3 (1.9%)	0 (0%)	0.14†
Self-employed	53 (32.9%)	57 (35.4%)	
Government employee	20 (12.4%)	28 (17.4%)	
Maternal occupation			
Housewife	65 (40.4%)	62 (38.5%)	0.11†
Self-employed	2 (1.2%)	2 (1.2%)	
Government employee	9 (5.6%)	21(13%)	
Duration of breastfeeding (month) mean± SD	20.8±8.7	18.2±9.5	0.7*
Duration of formula feeding (month) mean± SD	3.3±7.8	5.9±9.5	0.6*
Usage of nutritional supplements under age of two	55 (79.7%)	63 (88.7%)	0.14†
Usage of nutritional supplement in pregnancy period	24 (34.8%)	21 (29.6%)	0.51†

[Table/Fig-1]: Comparison of demographic information in cancerous and healthy children
*Student's t-test †Chi-square test

Type of cancer	N (%)
Acute lymphocytic leukemia	23 (33.3%)
Brain tumour	10 (14.2%)
Rhabdomyosarcoma	8 (11.5%)
Acute myeloid leukemia	6 (8.7%)
Non-Hodgkin's lymphoma	6 (8.7%)
Osteosarcoma	5 (7.1%)
Ewing's sarcoma	4 (5.8%)
Hodgkin's lymphoma	4 (5.8%)
Disgerminum	1 (1.4%)
Neuroblastoma	1 (1.4%)
Adenocarcinoma	1 (1.4%)

[Table/Fig-2]: Distribution of cases according to type of cancer

Treatment information	Cancerous children
Undergoing chemotherapy N (%)	76 (100%)
Duration of chemotherapy (month), mean±SD	12.1± 10.6
Undergoing radiotherapy N (%)	20 (26.3%)
Duration of radiotherapy (month), mean± SD	0.64± 0.3
Undergoing chemo radiotherapy	33 (43%)
Duration of chemo radiotherapy (month), mean± SD	10± 2.1
Surgery N (%)	28 (36.8%)
Bone marrow transplant N (%)	3 (3.9%)

[Table/Fig-3]: Methods and duration of treatment in children with cancer

Variable	Cancerous children	Healthy children	p-value
An individual with at least one decayed first molar	12 (15.8%)	8 (9.4%)	0.22*
An individual with at least one filled first molar	4 (5.3%)	8 (9.4%)	0.32*
An individual with at least one extracted first molar	2 (2.6%)	3 (3.5%)	0.79*
DMFT of all dentition (mean± SD)	6.7 (4.5)	3.3 (2.8)	0.00†
DMFT of the first permanent molar (mean± SD)	2.6 (1.5)	2.2 (1.6)	0.06†
Total number of teeth (Min-Max)	25 (16-28)	27 (18-28)	0.1†

[Table/Fig-4]: Information on teeth status in both groups
*Chi-square test †Mann-Whitney U-test

Variable	Cancerous children	Healthy children	p-value
Age (year)	1.488	-2.494	0.088
Sex	-0.788	2.855	0.065
Duration of breast feeding (months)	-0.168	0.727	0.520
Weight (kg)	-0.131	0.316	0.772
Medication during pregnancy	-0.460	0.715	0.526
Frequency of Tooth brushing per day	-0.355	1.745	0.179
Thumb sucking	0.524	-1.494	0.232
Mother's education level	-0.032	0.152	0.889
Father's education level	0.162	-0.551	0.620
Surgery	-0.771	2.091	0.128
Site of radiotherapy	-0.056	0.247	0.821
Type of malignancy	0.156	-0.358	0.744
Constant		2.749	0.071

[Table/Fig-5]: Role of confounding variables on DMFT index according to Logistic Regression in study groups

groups aged between 8 to 12 years. The mean age of patients under cancer therapy was 10.6 and that of healthy children was 11.1. The demographic information of all subjects is listed in [Table/Fig-1]. As shown in [Table/Fig-1], difference between patients under cancer therapy and healthy ones in terms of height was significant (p= 0.03). Meanwhile, patients and control group were significantly different in relation to parents' education (p= 0.01, p= 0.001). We found borderline significant difference (p= 0.05) between groups with respect to birth order as well.

According to [Table/Fig-2], the most frequent type of cancer among our patients was acute lymphoblastic/lymphocytic leukemia (33.3%) followed by brain tumour (14.2%), and rhobdomyosarcoma (11.5%). Meanwhile, chemotherapy alone or combined with other treatment modalities were used for all of our patients (100%) [Table/Fig-3].

[Table/Fig-4] shows information regarding teeth status of subjects. No significant difference was found between two groups in terms of remaining teeth (p= 0.1). According to this table, total DMFT showed significantly higher score in patients under cancer therapy compared to healthy ones (p=0.00). In addition, DMFT of four first permanent molars was borderline significantly higher in patients under cancer therapy than healthy ones (p= 0.06).

According to Logistic Regression, there was a positive relationship between age and DMFT index (p=0.088), in a way that when patients grew one year elder, DMFT index increased 1.5 units.

On the other hand, female gender compared to male had a negative relationship with a borderline statistical significance (p=0.65). Therefore, girls showed DMFT index in as much as 0.7 lesser than boys [Table/Fig-5].

DISCUSSION

In this study we compared demographic factors and teeth status between patients under cancer therapy with healthy peers in one of the most accredited cancer centers in Tehran, Iran.

According to our results, mean age of cancerous patients was 10.6 similar to Lauritano [11], without significant difference between patients under cancer therapy and healthy ones in this regard.

Regarding gender, in our study distribution of boys and girls in patients under cancer therapy and healthy group showed no significant difference comparable to Lauritano [11], but boys had a slightly more tendency to be involved by cancer.

Patients under cancer therapy were significantly shorter than healthy ones in our study contrary to Huang results [12] who demonstrated that children and adolescents with acute lymphoblastic leukemia were taller than expected at the time of diagnosis. The main reason for increased height of cancerous patients was unknown. In accordance with our results, Millot demonstrated decreased growth velocity in terms of height in children under 18 due to chemotherapy [13].

In our study, two groups did not show significant difference in terms of weight. In contrast to our results, Donaldson found that weight loss and anorexia were more common in cancerous patients [14].

Meanwhile Dalton demonstrated that children with ALL who were younger than 13 years had a statistically significant lower height and higher weight [15].

In regard to birth order, frequency of cancer was borderline significantly higher in children with lower birth order in accordance to Von Behren study [16].

We demonstrated that paternal and maternal level of education in cancerous children was significantly lower than controls. Parents of higher educational level possibly have more information regarding healthy nutrition and life style, which might prevent cancer in their children. In Barrera's study, parents of cancer groups were more likely to report lower educational achievement than that of controls similar to our results [17].

In our study, neither paternal nor maternal occupations were significantly different in case and control groups. Savitz reviewed how parental occupation might affect childhood cancer in the offspring through genetic changes or transplacental carcinogenesis. He mentioned that parents exposed to some occupational hazards such as drugs and X-ray were more vulnerable to have cancerous children. However, no clear casual associations have been yet established [18].

Based on our results, which is consistent with McKinney's [19], there was no significant difference between duration of breastfeeding or formula feeding and childhood cancer. However, Mathur has reported a significant difference between duration of breastfeeding among patients with and without cancer [20]. UK Childhood Cancer Study Investigators have suggested that breastfed children showed a borderline lower chance for some cancers [21]. Martin proposed that breast milk might decrease the risk of childhood cancers in as much as 9% for ALL, 24% for Hodgkin disease, and 41% for neuroblastoma [22].

We found no significant difference between cancer and control groups regarding usage of nutritional supplements either in pregnancy period or in childhood under the age of two. Wen and Thompson demonstrated a lower risk of cancer in children whose mothers consumed iron, folate and vitamin supplements during their pregnancy [23,24].

The most common cancer among our children patients was acute lymphocytic leukemia, followed by brain tumours, which is in agreement with the results of Barrera [17].

According to the present study, patients under cancer therapy had borderline significantly higher DMFT Index of four first permanent molars compared to controls indicating poorer teeth status among them. Thus special attention to improve oral hygiene among children with cancer is justified. According to Khan, status of the first permanent molar can be considered as an indicator to assess teeth health in regard to caries [25]. Moreover, this tooth is considered as the cornerstone of masticatory function, jaws development, and dental occlusion [26]. Based on Hunter, the earlier the first permanent molar is decayed or restored, the less it lasts in the oral cavity. In addition, it was reported that extraction of the first permanent molars before adolescence increases the need for orthodontic treatments twofold, and compromises the prognosis more than 50% [27].

Our study was in accordance with results of Hong study [28] who showed that DMFT of all dentition was significantly higher in cancerous children than healthy ones reflecting poor oral hygiene among these patients [29-31].

The possible reasons for high caries rate in cancerous patients includes: dental anomalies such as enamel hypoplasia due to anti-cancer therapy [8], poor oral hygiene [28], consumption of carbohydrate- enriched supplements to maintain weight, ignorance of oral complications on behalf of parents as a result of severity of the main illness [11], hyposalivation and its diminished antibacterial effects, and shift of bacterial flora to cariogenic subtypes [8].

LIMITATIONS

The limitation of the present study was parents and children unwillingness to cooperate.

We suggest more elaborated multi center studies in terms of different age groups and various types of cancer.

CONCLUSION

Patients under cancer therapy were shorter than healthy ones, and their parents were of lower educational level. In addition, their dental status was poorer than controls, which mandates planning for appropriate instructions to parents and children regarding oral health. Moreover, dental treatments should be accompanied along cancer therapy.

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